4X150A/7034
Radial Beam Power Tetrode

The Svetlana 4X150A/7034 is a compact radial beam tetrode. The 4X150A is intended for Class AB SSB linear RF amplifier service. It is intended for stationary and mobile equipment designs with power amplification at frequencies up to 500 MHz. The 4X150A has an indirectly-heated oxide cathode.

The Svetlana 4X150A is manufactured with rugged, all metal/ceramic construction and will withstand severe military environments. Further, the anode is capable of dissipating 250 watts with forced air cooling, and is rated accordingly. These improved characteristics make the Svetlana 4X150A fully equivalent to the 4CX250B.

The Svetlana 4X150A/7034 is manufactured in the Svetlana factory in St. Petersburg, Russia, and is designed to be a direct replacement for the 4X150A/7034 manufactured in the United States, England and elsewhere.

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Svetlana 4X150A/7034

General Characteristics

Heater: Voltage (AC or DC)	Min.	Nom.	Max.
	5.7	6.0	6.3
Cathode:			Oxide-coated, unipotential
Cathode-to-heater potential	± 150		V
Direct interelectrode capacitances, max.			
Grounded cathode:			
Input			15.7 pF
Output			4.5 pF
Feedback			0.04 pF
Mechanical			
Operating Position			Any
Base			Special 9-pin
Recommended socket			Eimac or Johnson SK-600 series
Maximum dimensions			
Height			64 mm (2.52 in.)
Diameter			41.6 mm (1.64 in.)
Maximum operating temperatures			
Ceramic-to-metal seals			250° C
Anode core			250° C
Cooling			Forced air
Maximum net weight			150 g (4.8 oz.)
Approximate shipping weight			0.7 Kg.(1.5 lb.)

Radio Frequency Linear Amplifier, Class-AB_1, SSB Operation

Maximum ratings		
DC plate voltage	2000	V
DC screen voltage	400	V
DC plate current	250	mA
Plate dissipation	250	W
Screen dissipation	12	W
Grid dissipation	2	W

Typical Operation

(Peak-envelope conditions except where noted, grid driven)

Plate voltage	1000	1500	2200	Vdc
Screen voltage	350	350	350	Vdc
Grid voltage*	-55	-55	-55	Vdc
Zero-signal plate current	100	100	100	mAdc
Single tone plate current	250	250	250	mAdc
Two-tone plate current	190	190	190	mAdc
Single-tone screen current**	10	8	5	mAdc
Two-tone screen current**	2	-1	-2	mAdc
Single-tone grid current**	0	0	0	mAdc
Peak rf grid Voltage**	50	50	50	V
Plate output power	120	215	300	W
Resonant load impedance	2000	3000	4000	ohms

* Adjust to specified zero-signal dc plate current ** Approximate values

Plate operation

Because of the all ceramic/metal construction and brazed anode cooler, the maximum rated plate dissipation power of the Svetlana 4X150A/7034 is 250 watts. This rating may be exceeded for brief periods during circuit adjustment without damage to the tube. The tube and associated circuits should be protected in the event of an internal arc by including a series current limiting resistance in the DC lead from the power supply to the plate. Its value must be 25 ohms or more. The resistor should be capable of withstanding the high surge current caused by the arc. It should not be used as a fuse.

Control-grid operation

The maximum grid dissipation rating of the 4X150A is two watts. The grid current is 2.0 milliamperes. The grid and associated circuitry should be protected against current surges in the event of internal arcs by a source impedance of greater than 50 ohms. For stability, the source impedance should not exceed 10K ohms.

Screen-grid operation

The maximum rated power dissipation for the screen grid is 12 watts, and the screen input power should be kept below that level. The product of the peak screen voltage and the indicated DC screen current approximates the screen input power except when the screen current indication is near zero or negative.

In the usual tetrode amplifier, where no signal voltage appears between cathode and screen, the peak screen voltage is equal to the DC screen voltage.

When signal voltages appear between screen and cathode, as in the case of screen-modulated amplifiers or cathode-driven tetrode amplifiers, the peak screen-to-cathode voltage is the sum of the DC screen voltage and the peak AC or RF signal voltage applied to screen or cathode.

The screen current may reverse under certain conditions, and produce negative current indications on the screen milliameter. This is a normal characteristic of most tetrodes. The screen power supply should be designed with this characteristic in mind, so that the correct operating voltage will be maintained on the screen under all conditions. A current path from screen to cathode must be provided by a bleeder resistor or shunt regulator connected between screen and cathode and arranged to pass approximately 15 milliamperes per connected screen.

The screen grid and associated circuits should be protected against current surges in the event of internal arcs by a source impedance of greater than 50 ohms. For stability, the source impedance should not exceed 10K ohms.

Cathode operation

The cathode is internally connected to the four even-numbered base pins, and all four of the corresponding socket terminals should be used to make connection to the external circuits. At radio frequencies, it is important to keep the cathode leads short and direct and to use conductors with large areas to minimize the inductive reactances in series with the cathode leads.

Svetlana recommends that rated heater voltage be applied for a minimum of 30 seconds before other operating voltages are applied.

Where the current design requires the cathode and heater to be operated at different potentials, the rated maximum heater-to-cathode voltage is 150 volts regardless of polarity.

Heater Operation

The rated heater voltage for the 4X150A is 6.0 volts and this voltage should be maintained as closely as practicable. Short-time variations of the voltage of ±10% of the rated value will not damage the tube, but variations in performance must be expected. The heater voltage should be maintained within ±5% of its rated value to minimize variations in performance and to obtain maximum tube life.

Multiple operation

Tubes operating in parallel or push-pull must share load equally. Svetlana believes that it is good engineering practice to provide for individual metering and individual adjustment of the bias or screen voltage to equalize the inputs.

Where overload protection is provided, it should be capable of protecting the surviving tube(s) in the event that one tube should fail.

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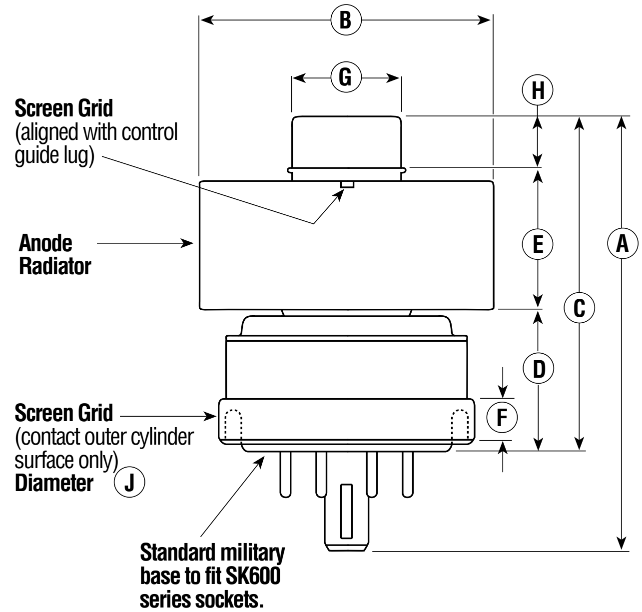
Mechanical Mounting

The 4X150A may be operated in any position. An Eimac or Johnson Air-System Socket, SK-600 series, or a socket having equivalent characteristics, is recommended. Sockets are available with or without built-in screen by-pass capacitors and may be obtained with either grounded or ungrounded cathode terminals.

Cooling

Sufficient cooling must be provided for the anode, base seals and body seals to maintain operating temperatures below the rated maximum values. Air requirements to maintain seal temperatures at 225°C in 50°C ambient air are shown in the table at upper right. These requirements apply when an air system socket is used with an anode chimney and when air-flow is in the base-to-anode direction.

4X150A/7034 Outline Drawing



Minimum Cooling Air-Flow Requirements				
	Sea Level		10,000 feet	
Plate dissipation (watts)	Air flow (CFM)	Pressure drop (Inches of water)	Air Flow (CFM)	Pressure Drop (Inches of water)
200	5.0	0.52	7.3	0.76
250	6.4	0.82	9.3	1.20

Dimensional Data		
Dim.	Millimeters	Inches
A	64	2.52
B	41.6	1.64
C	40	1.57
D	21	0.83
E	19	0.75
F	4	0.16
G	14	0.55
H	5	0.20
J	36	1.42

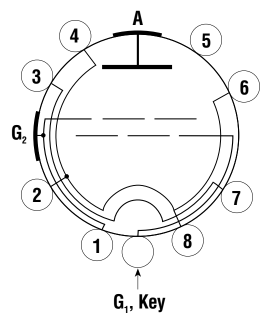
Vibration

The Svetlana 4X150A/7034 is capable of satisfactorily withstanding shock and vibration typically encountered in military applications. The tubes will function well in mobile airborne and mobile truck installations and similar environments.

Special applications

If it is desirable to operate this tube under conditions widely different from those given in this publication, contact any location of Svetlana Electron Devices (listed on the back panel).

Bottom View



4X150A/7034 Connection Diagram

Connection	Electrode
1	Screen Grid
2, 4, 6, 8	Cathode
3,7	Heater
5	Internal connection (do not use for external connection)
G_2 (coaxial ring)	Screen Grid
G_1 (key)	Control Grid
A (external)	Anode

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